

Obviously, there is uncertainty associated with the extrapolation of experimental results for such long periods. DOE selected the design analyzed in the Final EIS to mitigate the uncertainties by adding features (such as the drip shield) to provide defense-in-depth. This provides greater assurance that the repository would meet its performance standards in the face of uncertainty.

7.1.5 (7291)

Comment - EIS001683 / 0002

There are so many reasons why nuclear waste should not be stored at Yucca Mountain. The casks are not able to contain the waste. Bacteria found at the site can corrode them.

Response

The Yucca Mountain repository, as described in the May 2001 Supplement to the Draft EIS, includes a robust engineered barrier system designed specifically to work with the favorable natural-barrier system at Yucca Mountain. The container in which DOE would place nuclear waste in the repository would not be the sole engineered barrier. The current design includes a robust waste package with a nickel-base alloy (Alloy-22) as the outer corrosion-resistant barrier over a stainless-steel structural inner liner.

DOE is evaluating waste package materials, including Alloy-22, for reaction to an attack by microbes under conditions expected at Yucca Mountain. To date, this evaluation has identified no bacteria-related concerns for Alloy-22. However, for conservatism, DOE added a microbial attack factor to the assessment of the long-term performance of Alloy-22. Information in the Supplement, carried forward to the Final EIS, evaluates the new design and materials for waste packages and explains the rationale for the enhancements.

7.2 Repository Operational Plans

7.2 (1704)

Comment - EIS000624 / 0002

I have been told by many of them people there, if [an] accident ever happens out there, we're going to get the robots out here from back east, two of the robots. They are going to handle it. I think that's under no agreement, or I don't know what you call it. Let's all think about it. What are we going to do if accident ever happens?

Response

Section 4.1.8 of the EIS describes potential accident scenarios. In the event of a radiological accident, DOE would use remotely controlled equipment such as inclined plane haulers, load-haul-dumps, and other special equipment to recover from such accidents. This equipment exists today. DOE has identified and developed the methods for retrieval and the equipment and procedures it would use for retrieval under both normal and abnormal conditions. The Department would not rely on "robots" or any other technology strictly from one source or location.

Tables 2-7 of the EIS compares the potential accident consequences for the Proposed Action and No-Action Alternative. Appendix H contains a more detailed discussion.

7.2 (5327)

Comment - EIS001887 / 0055

Page 1-17; Section 1.4.2 - Proposed Disposal Approach

The third sentence of the first full paragraph indicates that "(t)he waste packages would be moved underground by rail." This is also described elsewhere in the document (Section 2.1.2.2.1 Subsurface Facility Design and Construction, Page 2-27 through 2-31). However, nowhere does the Draft EIS indicate what level of inspection will be performed on the rail/trolley system, as well as other infrastructure in place at the site. Inasmuch as a transportation or emplacement related accident at the site could have catastrophic and long-term impacts to Nevada, quality control, inspection by qualified outside expertise, and a comprehensive maintenance and inspection program for the transportation activities and infrastructure within the site are critical to program safety. The Draft EIS fails to address this important component of long-term site safety.

DOE can contract for such services from the private sector, utilize existing contractors, hire DOE expertise in these areas, or provide resources so that other State or federal agencies conduct inspections. Additional resources for affected federal or state agencies would need to be quantified and funded accordingly.

Response

Prior to construction and operation of a repository, the Nuclear Regulatory Commission would first have to issue a license under the provisions of 10 CFR Part 63. The Commission has always required a strong quality assurance program for licensed nuclear facilities. DOE expects that the license provisions for an in-depth quality assurance program at a deep geologic repository would be no less stringent than those required for other nuclear facilities. Required elements of an effective quality assurance program would include inspection by independent experts as well as a comprehensive maintenance program. However, although DOE is committed to funding an effective quality assurance program, estimating the resources required at this time would be too speculative to provide meaningful information to the decisionmaking process. Therefore, this information has not been included in the EIS.

DOE agrees that even with the best approach to operations and maintenance, accidents could occur. Therefore, a number of accident scenarios have been evaluated both at the repository and during transportation. Impacts from these accident scenarios are described in Chapter 4 of the EIS.

7.2 (5352)

Comment - EIS001887 / 0073

Page 2-11; Section 2.1.2 - Repository Facilities and Operations

The statement is made that "...spent nuclear fuel and high-level radioactive waste would be handled remotely with workers shielded from exposure to radiation using design and operations practices in use at licensed nuclear facilities to the maximum extent practicable" (emphasis added). Since the Yucca Mountain facility is required to be licensed by the NRC [Nuclear Regulatory Commission] and all facility operations would be carried out under NRC regulations, it is inaccurate to assume that practicability would dictate which regulations would be followed and which would not be. The statement that practices used in other licensed facilities would be implemented at Yucca Mountain only to the extent practicable is indicative of the assumption throughout the document and the entire DOE program that regulations and requirements can be changed, modified, or suspended to meet the dictates of the project.

Response

DOE agrees that all facility operations would be conducted in accordance with license requirements issued by the Nuclear Regulatory Commission. In addition, repository designs and operating procedures must satisfy Commission regulations, or DOE would not receive a license to build and operate the facility. However, the Department does have the ability to decide which design features and procedures it feels will best satisfy those regulations. Many functions of the repository, such as cask handling and fuel storage, would be identical to those at existing nuclear facilities. Therefore, DOE has many examples from which to choose to satisfy the regulations.

7.2 (5372)

Comment - EIS001887 / 0089

Page 2-37; Section 2.1.2.4 - Performance Confirmation Program

As part of performance confirmation and prior to initiation of waste emplacement, DOE should commit to a demonstration of a full drift emplacement-retrieval cycle as a proof of operational capability.

Response

As part of routine pre-operational testing, DOE would test the waste package transporter, emplacement gantry, and emplacement operations before such operations began, which would not be before 2010. The retrieval operation would use essentially the same equipment and operations as emplacement (in reverse order), so the tests would be relevant to demonstrating the capability for retrieval.

7.2 (5373)

Comment - EIS001887 / 0090

Page 2-38; Section 2.1.3.1 - Loading Activities at Commercial and DOE Sites

The text states “.the EIS assumes that at the time of shipment the spent nuclear fuel and high-level radioactive waste would be in a form that met approved acceptance and disposal criteria for the repository.” In the case of commercial spent fuel, there is no basis for making such an assumption. Given the market-driven, [laissez] faire approach planned for transporting spent fuel from reactor sites to Yucca Mountain, the form of the spent fuel to be shipped will be determined by the type of transport canister used and the shipment mode selected. Both of these factors will be determined largely by economic factors and by conditions and infrastructure at each reactor location. DOE will likely deal with widely diverse spent fuel configurations, including different shipping cask configurations, different shipment loads and weights, different conditions of fuel elements, etc. The overly optimistic assumption that spent fuel and HLW received at the repository surface facilities will be in standard forms and require little or no remediation or special handling is erroneous and understates the difficulties associated with the waste acceptance and handling operations at the repository.

The level of effort required at a repository waste acceptance, handling, and processing facility will be one that is unprecedented in volume, diversity of waste forms, and duration. The handling of spent fuel is currently done only on a very limited scale, usually one or two fuel assemblies at a time, at reactor locations. There is no experience with the scale and complexity of operations that would be required to process hundreds of thousands of spent fuel elements (both at points of departure and at the repository surface facilities) over a sustained period of 30 years or more. The Draft EIS completely ignores the unprecedented nature of this effort and, instead, treats it as if it were a routine industrial activity.

Response

The Waste Handling Building would be able to handle a variety of waste forms consistent with known waste acceptance and transportation requirements. DOE is developing detailed waste acceptance and interface criteria documents with which the waste generators would have to comply and that will identify the characteristics of acceptable waste forms for the repository. These documents will contain the details of the standard waste forms that the repository would be able to accept and would be part of its licensing basis. The waste forms would include commercial spent nuclear fuel packaged in different truck and rail casks, and in dual-purpose canisters. Some of the shipments would contain failed fuel or radioactive nonfuel components. In addition, a variety of defense nuclear waste forms including DOE spent nuclear fuel and high-level radioactive waste would be shipped in canisters that could be placed directly in disposal containers (waste packages). The repository's waste handling systems would include the variety of tooling required to handle the diversity of shipments, open and handle them, and package the various waste forms for disposal.

DOE disagrees with that part of the comment that contends that the loading and transportation of commercial and DOE spent nuclear fuel would be market driven. Waste transport would be governed by strict safety requirements mandated by the Nuclear Regulatory Commission for commercial facilities and by DOE for its sites. Over the past 30 years there have been thousands of shipments of commercial spent nuclear fuel in the United States without notable radiological releases or incidents of exposure, which is evidence that such loading can occur safely. Section 6.2.2 of the EIS contains more information.

System and facility designs can accommodate the handling of abnormal and damaged waste forms. These include systems for handling a damaged waste package (the Waste Package Remediation System). Shipments of commercial spent nuclear fuel would be licensed in accordance with the provisions of 10 CFR Part 71, which provided much of the information for the Waste Handling Building related to such spent nuclear fuel.

Although the waste handling operations would be a significant undertaking, DOE would use proven techniques, technology, and practices to develop the design. Such operations are not unprecedented. All of the waste to be handled at the repository would have been moved at least once to a facility or storage system before being transported. Commercial reactor sites have received, stored, and loaded nuclear fuel for decades, and have provided packaging, shipping, and surface storage of spent nuclear fuel. Computer modeling verified that current preliminary designs could meet the conservative (maximum expected) waste receiving, handling, and packaging rates with some

margin. In addition, the model used realistic reliability and maintainability data to account for equipment outages during the model runs.

7.2 (5424)

Comment - EIS001887 / 0124

Page 2-60; Section 2.2.1 - Yucca Mountain Site Decommissioning and Reclamation

If Yucca Mountain is not used as a repository under the No-Action Alternative, all openings should be sealed, not just gated. Under the NWPA [Nuclear Waste Policy Act], the site would be permanently removed from consideration as a repository.

DOE should state that the activities discussed in this section will be carried out according to federal and State requirements and as required by BLM [the Bureau of Land Management] in the applicable right-of-way grants that are, and have been, in place throughout Yucca Mountain site investigations.

This section provides no detail about reclamation procedures, their application, and their chances for success.

Response

Chapter 7 of the EIS describes the impacts if the Yucca Mountain site was found unsuitable or otherwise dropped from consideration as a repository and the specific actions that DOE would take. Section 7.1.4 describes the reclamation activities that would occur at Yucca Mountain, and the “Reclamation Implementation Plan” (DIRS 102188-YMP 1995) describes the procedures for those activities. The Bureau of Land Management developed reclamation procedures in accordance with stipulations agreed to when it granted rights-of-way for site characterization to DOE. Section 3.1.1.2 contains information on these rights-of-way.

DOE would gate, rather than seal, the North and South Portals at Yucca Mountain. Backfilling and sealing of the Exploratory Studies Facility would create environmental impacts that would outweigh the environmental and cost benefits of gating these portals.

7.2 (5598)

Comment - EIS001887 / 0224

Page 4-20; Section 4.1.3.2 - Impacts to Surface Water from Construction, Operation and Monitoring, and Closure

What methods would be established to control water application amounts for surface and subsurface dust suppression? DOE’s track record for controlling and tracking water usage during site characterization is weak, at best.

Response

DOE has not selected exact methods for controlling surface dust. Section 4.1.3.2 of the EIS states that DOE would establish controls as necessary to ensure that water application for subsurface and surface control of dust did not affect repository performance or cause substantial impacts. Tables 4-9 and 4-10 include the estimated water use required for surface facility dust control during construction in the total water use.

7.2 (5599)

Comment - EIS001887 / 0225

Page 4-22; Section 4.1.3.2 - Impacts to Surface Water from Construction, Operation and Monitoring, and Closure

The Draft EIS should provide actual details of the plan for managing spills and radiological contaminant leaks, not just give a reference as an “example” of what might be done.

Response

The purpose of the EIS is to evaluate the environmental impacts of the Proposed Action and alternatives. Detailed plans for managing spills and radiological contaminant leaks would be prepared as part of the licensing process, if the repository was approved for development by the President and Congress, if necessary, and would not contribute in a meaningful way to discriminating between design scenarios. However, DOE believes that environmental consequences of spills and radiological contaminant leaks during construction, operation and monitoring, and closure would be minor and manageable.

7.2 (5600)

Comment - EIS001887 / 0226

Page 4-23; Section 4.1.3.2 - Impacts to Surface Water from Construction, Operation and Monitoring, and Closure

The Draft EIS should provide the actual surface environmental monitoring plan.

Response

DOE would develop a surface-water monitoring plan during the License Application phase. The purpose of the EIS is to determine the environmental consequences of the Proposed Action and the No-Action Alternative. Inclusion of a surface-water monitoring plan in the EIS would add unnecessary bulk.

As described in Section 4.1.3.2 of the EIS, DOE contends that the environmental consequences to surface water from construction, operation and monitoring, and closure would be minor and manageable. High- and low-level radioactive waste would be handled under fully contained and controlled conditions. The facilities and systems would be designed for confinement and safety. Use of hazardous materials would be subject to administrative controls, and nonhazardous material substitutes would be used to the maximum extent possible. Spills of hazardous materials, should they occur, would be handled in accordance with all applicable Federal and state regulations.

7.2 (6420)

Comment - EIS001632 / 0009

Page 2-31: The third full paragraph describes removing materials from the repository during the subsurface construction that occurs simultaneously with waste emplacement. What plans does the Department have for monitoring the water and other material being removed during waste emplacement operations? Monitoring should ascertain that no radioactive contamination is being removed. While it is not likely that such contamination will occur, there is always the possibility of contaminants adhering to the surface of waste packages and getting into the water or material being removed, or of an accident occurring.

Response

DOE would emplace waste packages in underground tunnels at the same time it was constructing additional tunnels. However, the two areas of operation would be isolated from one another. Section 4.1.3.2 of the EIS discusses potential impacts to surface water from repository construction, operations, maintenance, monitoring, and closure. As stated in that section, DOE would pump water from subsurface construction areas to a lined evaporation pond at the South Portal Operations Area. It would pump water from the emplacement areas, if any, to a lined evaporation pond at the North Portal Operations Area, but only after verifying that it was not contaminated.

DOE would remove solid materials through mining operations, but only from the development area. Bulkheads would isolate this area from the emplacement side, and the ventilation system would ensure that air leaks would be from the development side to the emplacement side (because it would maintain a lower pressure on the emplacement side).

7.2 (6862)

Comment - EIS001466 / 0007

Another interesting experience was being on top of the mountain, and in one single spot, because you have a view, a lot of this equipment was nearby. I found it really interesting that all the weather monitoring equipment, the seismographs and other machines up there were solar powered. I really liked that. I thought that was great. And one of the proposals for ventilating Yucca Mountain, because the heat is going to be so intense from the waste is -- or was, I'm not sure if it's still a project proposal, but a solar powered -- the whole mountainside has solar power panels to drive the ventilation system at Yucca Mountain. So it's the world's first solar powered nuclear waste dump.

Response

As described in the Supplement to the Draft EIS (released for public review in May 2001) and carried forward to the Final EIS, DOE would construct a 3-megawatt solar power generating facility which would operate in conjunction with commercial power to meet the power needs of the repository.

7.2 (7224)

Comment - EIS001337 / 0103

Page 4-3 4th full paragraph. This section should describe what factors will be used to determine whether a 50 or 300 year performance confirmation period will be utilized. The length has implications for PETT [Payments-Equal-to-Taxes] payments and timing of possible retrieval and related transportation activities.

Response

Testing and performance confirmation activities would extend until the beginning of repository closure. DOE would decide on the exact date in concurrence with the Nuclear Regulatory Commission and any laws and regulations that exist at that time. For analysis purposes, the Draft EIS evaluated closure starting 100 years after the start of emplacement, but also assessed impacts for closure starting 50 and 300 years after the end of emplacement. The updated flexible design presented in the Supplement to the EIS includes a lower-temperature operating mode with ventilation extended for 300 years after final emplacement. The impacts related to this and other operating modes for the flexible design are presented in Chapter 4 of the Final EIS.

Waste shipments to the repository would not be influenced by a date for starting closure. Payment-Equal-to-Taxes is required under the NWPA, and is not a discriminating factor in the decisionmaking process. DOE has not estimated Payment-Equal-to-Taxes beyond 2003 and, therefore, has not included long-term Payment-Equal-to-Taxes estimates in the EIS.

DOE agrees that the final closure date could affect the timing of any retrieval that might be required. However, the impacts of such contingency action would be relatively insensitive to timing and such an evaluation would produce little meaningful information for the decisionmaking process. For this reason, DOE has not included this evaluation in the EIS.

7.2 (7542)

Comment - EIS001912 / 0061

Pg. 4-2 How long will it take to construct the repository including all the emplacement tunnels? What is the total estimated cost of construction?

Pg 4-4 Repository design is not conceptual-it is unproven. DOE at this point cannot prove that any of the design alternatives can meet licensing standards. DOE cannot even demonstrate with models or otherwise that their design alternatives can work.

Response

The estimated time to construct the surface facilities, main drifts, ventilation systems, and initial emplacement drifts is five years. Construction of emplacement drifts would continue through about 2032. Section 2.1.5 of the EIS presents updated cost estimates for the proposed repository. Total system life-cycle costs would range from \$42.8 billion to \$57.4 billion, depending on the repository operating mode.

The purpose of the EIS is to evaluate the consequences of the Proposed Action and the No-Action Alternative. The intent is not to demonstrate compliance with a regulatory licensing requirement. EISs are often based on conceptual designs. The evolution of the design of the repository has included a comprehensive evaluation of alternative features and concepts prior to the selection of the design upon which DOE based the Draft EIS. Since publication of the initial Draft EIS in July 1999, the design of the repository has continued to evolve. This evolved design was described in a Supplement to the Draft EIS that was released for public review in May of 2001 and was carried forward to the Final EIS. The evolved design includes the flexibility to operate the repository in either a higher- or lower-temperature mode after closure. The evolved design includes more robust waste packages and titanium drip shields over each waste package to protect the waste packages from moisture and rockfalls.

DOE recognizes that absolute proof of long-term performance of the repository is not possible. The Environmental Protection Agency, in promulgating the Yucca Mountain environmental protection standards (codified at 40 CFR Part 197), recognized that, with the current state of technology, it is impossible to provide a reasonable expectation that there will be "zero" releases over 10,000 years or over a longer period. Therefore, the Agency promulgated standards that it believes provide comparable protection to those of other activities related to radioactive and nonradioactive wastes. These standards do not require complete isolation of the wastes over the compliance period

(10,000 years) or the period of geologic stability (1 million years). The goal of a performance assessment for Yucca Mountain supporting the site recommendation decision and later licensing (if the site is recommended), is to evaluate whether the repository is likely to meet these standards. The goal of this EIS is to project possible impacts using similar modeling technology.

Therefore, as directed by the NWSA and consistent with Environmental Protection Agency and Nuclear Regulatory Commission guidelines, DOE will continue the characterization effort at the Yucca Mountain site. If this effort determined the site was suitable, and if a recommendation by the Secretary was accepted by the President and Congress, if necessary, the Department would continue detail design and licensing efforts necessary for construction, operation and maintenance, monitoring, and eventual closure of the repository. These efforts would use the best science and construction techniques available at the time to provide a reasonable expectation that the repository would meet the environmental protection standards of 40 CFR Part 197, as well as the site suitability standards of 10 CFR Part 63, thus ensuring the long-term protection of the general public and the environment.

7.2 (7572)

Comment - EIS001912 / 0067

Pg. 4-98. Describes short-term impacts from the [of] a retrieval contingency yet the proposed action does not include such action. Why? The contingency action needs to be completed and described in the proposed action.

To be consistent with the no-action alternative (scenario 2), the DEIS must describe impacts from the loss of institutional control. The analysis of the contingency must also describe the costs to manage waste in this form indefinitely and who would be responsible for the cost. Maintaining waste on-site at Yucca Mountain would be similar to the no-action alternative-deep geologic storage would be the preferred option.

Response

Section 122 of the NWSA requires DOE to maintain the ability to retrieve the materials emplaced in the repository in the event of a decision to retrieve them to protect public health and safety or the environment or to recover constituent parts of spent nuclear fuel. This retrieval requirement is reflected in the Nuclear Regulatory Commission's disposal regulations [10 CFR 63.111(e)]. Although DOE does not anticipate that retrieval would be necessary, it would utilize the repository design to maintain the ability for future generations to retrieve these materials for at least 100 years and possibly for as long as 300 years after emplacement operations began (see Section 4.2 of the EIS). The Federal Government, therefore, would maintain stewardship of the repository site for generations to come. These stewardship activities would entail site protection, confirmatory scientific work and a postclosure monitoring program required by Nuclear Regulatory Commission rules governing the disposal of high-level radioactive wastes in a geologic repository (10 CFR 63.51). The decision to close the repository (and thus give up active control) would come after the approval of a license amendment supported by what would be new and more advanced analyses utilizing future data and modeling tools.

Although it is not part of the Proposed Action, DOE has considered the impacts of retrieving spent nuclear fuel from the repository as a contingency action and describes the potential impacts if it was to occur (see Section 4.2 of the EIS). The Department evaluated only those actions that it could predict with any certainty (that is, removal of the emplaced waste materials and subsequent onsite storage). Because any future actions regarding the management and disposal of these materials following retrieval would be at the direction of Congress, and because they are highly speculative and unnecessary to support current decisionmaking, DOE believes it is inappropriate to attempt to evaluate impacts that could result from these actions.

Under Nuclear Regulatory Commission regulations (10 CFR Part 63), the required "description of plans" for retrieval operations is not the same as that required for the designs and plans associated with fuel receipt, handling, and emplacement. The Commission would have to approve a decision to retrieve the waste (separate from the Proposed Action), at which time it would review detailed retrieval plans and facility designs.

A loss of institutional control under retrieval circumstances is not a feasible occurrence. Nuclear Regulatory Commission regulations (10 CFR Part 63) require that DOE institute active and passive institutional controls, so the repository design contains such controls. The controls would reduce, for as long as possible, the potential that human activity could degrade long-term repository performance. Scenario 1 of the No-Action Alternative includes an analysis of impacts under effective institutional controls for at least 10,000 years and is consistent with the

portion of the analysis of the Proposed Action that includes an analysis of effective institutional controls for the first 100 years after closure. Scenario 1 assumes that the spent nuclear fuel and high-level radioactive waste would be stored in a configuration that would allow retrieval at any time in the future; therefore, long-term retrievability is not an issue. The Scenario 2 analysis of the No-Action Alternative does not consider institutional controls after approximately 100 years and is parallel to the portion of the Proposed Action analysis in which long-term performance after 100 years does not include institutional controls.

Concerning economics, the costs associated with the Proposed Action would be greater during the first 100 years; the ongoing costs associated with continued storage under the institutional control scenario would be far greater. Most of the funding for site characterization and ultimately development of a repository, should the project proceed to that stage, comes from ratepayers who benefit directly from the use of nuclear power. Continued storage of spent nuclear fuel at generator sites would also be ratepayer-funded. The analysis assumed that continued storage facilities would require replacement every 100 years, and there would be a major facility repair halfway through the first 100-year cycle. Under Scenario 2, loss of institutional control, the projected economic impacts would be the same as those for Scenario 1 for the first 100 years, but after that approximately 800 jobs would be lost.

Cost estimates of the No-Action Alternative are presented in Section 2.2.3 of the EIS and estimates of the Proposed Action are presented in Section 2.1.5. However, a specific cost/benefit analysis has not been performed because it is not necessary to support current decisionmaking. It is DOE's opinion that sufficient information about potential impacts to the public health, safety, and the environment is provided in the EIS to support current decisionmaking.

7.2 (7989)

Comment - EIS000817 / 0049

If you are cooling and venting casks as you unload them, I assume gases and water released will be highly contaminated.

Response

DOE has extensive experience with the unloading of transportation casks. Experience has shown that cask gases and interior surfaces are sometimes contaminated from dislodging crud from spent-fuel-element surfaces during transportation. Normal cask-unloading operations include checking the cask exterior for contamination, sampling the cask gases, and venting the interior gases through filtration. Before using the cask again, the external surfaces are checked for contamination and decontaminated, producing small amounts of low-level waste. Nuclear facilities routinely conduct loading and unloading operations using methods and equipment designed to accommodate contamination to ensure that no contaminated gases or radioactivity from cask surfaces are released. The equipment designed for Yucca Mountain incorporates features developed over several decades of safe handling of spent nuclear fuel at U.S. nuclear facilities.

7.2 (8233)

Comment - EIS001873 / 0027

P. 2-13. The discussion of closure scenarios must identify any conditions that might affect the ability of the DOE to carry out this fifteen year project 300 years from now.

Response

Section 2.1.2.4 of the EIS discusses the steps DOE would take to close the Yucca Mountain Repository. Since the publication of the Draft EIS, the Department has modified the repository design to include drip shields over the waste packages and forced ventilation during the operation and monitoring phase. The drip shields would be placed over the waste packages immediately before closure. The forced ventilation would end when DOE closed the repository. The current design does not involve the placement of backfill over waste packages. The Final EIS discusses these design changes and the steps DOE would take to close the repository.

The flexible design includes operating scenarios that would require the repository to remain open for at least 300 years after the end of emplacement. During this period, the repository would remain accessible for scientists to continue testing and monitoring while providing more flexibility for future generations of scientists and engineers who will conduct repository performance confirmation and ultimately determine the timing and methods of repository closure. However, DOE believes that that the conceptual information contained in Section 2.1.2.4 of the

Final EIS provides an adequate basis for estimating closure impacts for purposes of informing the decisionmaking process.

7.2 (8327)

Comment - EIS000817 / 0111

Now here -- here at this giant ISFSI in Nevada -- after retrieval -- here is where you could have the big degradation of casks that you describe could happen at reactors. The reason it could happen here is that there are just too many casks in one place to recask them all if need be in 20-40 years, etc. What is the plan for storage monitoring and upkeep of casks, if the whole repository load is actually retrieved? What are doses to workers and the public if all these casks need future unloading and recasking? Plan for that!!

Response

Section 4.2 of the EIS examines the potential impacts from retrieving the waste. Retrieval is not part of the Proposed Action, but rather a contingency required by Section 122 of the Nuclear Waste Policy Act. DOE would maintain the ability to retrieve the waste for at least 100 years and possibly as long as 300 years. Management of these materials following retrieval would be in accordance with license conditions approved by the Nuclear Regulatory Commission. If the material were to be deemed unsuitable for re-emplacement into the repository, alternate disposal options would be at the direction of Congress. However, in the event the materials were determined to be unsuitable for re-emplacement into the repository, some period of surface storage would be required.

Since publication of the Draft EIS, a more detailed study of the retrieval contingency action has been completed for the flexible design [see Section 2.3.4.6 of the Science and Engineering Report (DIRS 152985-DOE 2001)]. This study includes considerations for normal and off-normal operations including handling and repackaging damaged waste packages. However, because of the low probability that the retrieval contingency would be implemented and the uncertainties related to the possible condition and integrity of the retrieved packages, DOE believes the impacts estimates for such action would be too speculative to provide meaningful information for the decisionmakers. For this reason, potential impacts of the retrieval contingency have not been provided in the EIS.

7.2 (8330)

Comment - EIS000817 / 0112

You are better off leaving small ISFSIs [independent spent fuel storage installations] at the reactors where they are now and can be taken care of. Why are you expecting only to put the waste package in a concrete module? Some fuel may have to be unloaded. And modules may have to be replaced too. Think of this large retrieval ISFSI long into the future. What will have to be done? Long term? Just remember, all the movement of the cask handling will result in some problems. I doubt that your statement p.4-107 "the waste packages would not be opened" will prove to be the case.

Response

Section 4.2 of the EIS examines the potential impacts from retrieving the waste. Retrieval is not part of the Proposed Action, but rather a contingency required by Section 122 of the Nuclear Waste Policy Act. DOE would maintain the ability to retrieve the waste for at least 100 years and possibly as long as 300 years. If retrieval were required, surface storage would be in compliance with regulations that exist at that time.

Since publication of the Draft EIS, a more detailed study of the retrieval contingency action has been completed for the flexible design [see Section 2.3.4.6 of the Science and Engineering Report (DIRS 152985-DOE 2001)]. This study includes considerations for normal and off-normal operations including handling and repackaging damaged waste packages. However, because of the low probability that the retrieval contingency would be implemented and the uncertainties related to the possible condition and integrity of the retrieved packages, DOE believes the impacts estimates for such action would be too speculative to provide meaningful information for the decisionmakers. For this reason, potential impacts of the retrieval contingency have not been provided in the EIS.

7.2 (8369)

Comment - EIS001873 / 0054

P. 4-86. Impacts from cask maintenance should be included.

Response

Although it could be located either onsite or offsite, the environmental impacts from Cask Maintenance Facility are included in the impact analyses for the entire repository. See the various subsections under Section 4.1 of the EIS.

7.2 (9591)

Comment - EIS001888 / 0265

Service and Maintenance Support

This refers to the “personnel, facilities, equipment, materials, and system for transportation cask system equipment maintenance, inspection, repair inventory, regulatory compliance, and decommissioning.” Will the waste packages be opened and the waste inspected before it is disposed? Will the waste be shipped in a single container with multiple uses, or will waste be transferred from a shipping container to a disposal container? If so, where will the facility to perform such an operation be located? When will it be built? By whom?

Response

The May 2001 Supplement to the Draft EIS and Section 2.1.2 of the Final EIS describe the design and operation of the repository. The transportation casks that would be used to transport the waste to the repository would be opened and the waste forms removed and inspected. Some commercial spent nuclear fuel could arrive at the repository in canisters that could be moved from the transportation cask to the waste package without being opened. In such cases the canister itself would be inspected. Commercial spent nuclear fuel could also arrive at the repository as individual assemblies that would be unloaded and placed into the spent nuclear fuel blending inventory pools. When a fuel assembly was relocated from the fuel blending pool for packaging, it would be prepared for and loaded into a waste package one by one. All DOE waste forms would arrive in canisters that would be taken from transportation cask to waste package without being opened. Waste forms packaged in canisters prior to shipment to the repository would be inspected before the canister was sealed. The canisters themselves would be inspected at the repository, but not opened. See Section 2.1.2.1.1.1 and 2.1.2.1.1.2 for a more detailed description and also Science and Engineering Report, Section 2.2.4.2.1.

The receipt and unloading of transportation casks, and the loading and sealing of waste packages, would be done at the surface facilities at the North Portal Area on the east slope of Yucca Mountain. The EIS analysis assumes that construction of these facilities would start around 2005 and that operations would begin in 2010. There has been no decision as to who would construct these facilities.

7.2 (9788)

Comment - EIS001888 / 0374

[Clark County summary of a comment it received from a member of the public.]

One commenter requested that the EIS evaluate the potential for spills to penetrate into the ground.

Response

As described in Section 4.1.3.2, DOE believes that the environmental consequences to surface water from construction, operation and monitoring, and closure of the repository would be minor and manageable. High- and low-level radioactive waste would be handled under fully contained and controlled conditions. The facilities and systems are designed for confinement and safety. Use of hazardous materials would be subject to administrative controls, and nonhazardous substitute materials would be used to the maximum extent possible. Spills of hazardous materials, should they occur, would be handled in accordance with all applicable Federal and state regulations.

DOE would develop operational plans for managing spills during the License Application phase, as the preliminary design progresses.

7.2 (10394)

Comment - EIS002192 / 0004

Now I’ve been around the horn a few times and I can only say they cannot say how long the repository will be opened 50, 100, 300 years, and this is again a very ambiguous attitude of DOE, DOD [Department of Defense], EPA [Environmental Protection Agency] and NRC [Nuclear Regulatory Commission], and I’m sure people don’t realize how dangerous this is.

Response

As stated in Section 2.1.2 of the EIS, the design of the repository maintains the capability to close as early as 50 years or as late as 300 years after the start of emplacement operations. The purpose for this approach is to provide future decision makers with sufficient flexibility in determining when the repository should be closed.

The earlier closure time, 50 years after emplacement would begin, stems from the requirement by the Nuclear Regulatory Commission that waste retrieval be possible at least 50 years after the start of emplacement operations (10 CFR Part 63). For analysis purposes, Chapter 4 of the EIS assumes that closure would begin between 100 and 324 years after the start of emplacement.

7.2 (10415)

Comment - EIS002205 / 0001

All the water, and it's pumped into Yucca Mountain through pipes, every bit of it on a meter. This is recorded, and any wastewater -- we use water. The dust is the problem because there's no water in the mountain. It's all powder river, it's all lava rock, and they're digging with alpine miners or blasting or whatever, you spray the dust and it's brought on a conveyor system.

The conveyor system has foggers on it that spray onto the rocks and the dirt so they won't have to keep the dust down, and what you saw as far as the ten down, that's for the wipers on the conveyor system that cleans off any of the excess after the head roll and it falls down into tanks, but all this water is collected in tanks and it's pumped back into another pipe that is metered and goes back outside, and they can compare their meter readings on how much water was used and how much was pumped back in and they -- the difference is how much was left in the ground, and they have criteria where you can only have so much water or waste so much, but it's -- they're not trying to hide anything, and water does not pour out of that mountain, trust me.

Now, you got into that when that tunnel boring machine came through that south portal. It's spraying water all over. Well, on the tunnel boring machine, you spray water on that to keep the dust down. Otherwise, I mean, you've got men working in there. They're in respirators, but the dust gets so thick, you can't even see, so you have to control the dust as best you can, and that's why use of water, but all that water is still measured back into sumps, pumped back out -- outside, but it's all recorded.

Response

Section 4.1.3.2 of the EIS addresses the impacts to surface water from repository construction, operation and monitoring, and closure. The EIS also discusses the potential for treatment and/or recycling of water throughout the preclosure period.

DOE has concluded that any impacts to surface water from construction, operation and monitoring, and closure of the repository would be minor and manageable.

7.2 (10913)

Comment - EIS001293 / 0001

I wish I could endorse and support the Yucca Flats project. The United States and the World needs a viable method for storage and permanent disposal of high-level nuclear waste. However, I cannot endorse this project for reasons that I will get to in a moment.

The concept of underground storage presumes that high-level wastes generate relatively small amounts of heat that can be dissipated in the rock. On the contrary, heat generation is sufficiently large and prolonged that heat must be continuously transferred to the environment in order to keep the wastes immobile.

Assume that spent fuel is allowed to decay in storage pools for 30 years after removal from the reactor. By this time 98% of the remaining radioactive decay and heat generation is accounted for by two isotopes, strontium-90 and cesium 137. It can be calculated that the heat generation from 15,000 metric tons of spent fuel (the present U.S. inventory) is approximately 19,000 kW. One hundred seventy years later (200 years after removal from the reactor) the wastes will generate 300 kW of heat.

These heat generation rates can be compared with the normal heat flow from Earth of approximately 0.215 kW per acre. This heat is transferred to the surface with a temperature gradient of about 9°C per thousand feet. Assume that the waste canisters are distributed under 1000 acres of the Yucca Mountain repository. This gives an initial heat flow of 19 kW per acre, which is 90 times normal heat flow. In theory, the waste-containing strata will rise in temperature until long-term equilibrium is reached and heat generation equals heat flow to the surface. In practice, the wastes will soon reach melting and volatilization temperatures and begin to migrate from the repository depths. Groundwater that comes into contact with the molten wastes will form steam, which will speed up waste migration.

These calculations, which I made from information in published government and nuclear industry sources, help explain why repeated attempts to plan and build underground high-level radioactive waste repositories have come to naught. I predict Yucca Mountain will be another exercise in futility, and the ever-increasing waste inventory will continue to burden our future.

Response

The waste in the repository would generate a large amount of heat, which would decrease with time. DOE has conducted detailed tests of the effects of heat on the rock at Yucca Mountain, and developed computer models that predict the results of these tests within reasonable limits. Based on these computer models, the temperatures of the waste inside the waste packages would remain below the melting point. Therefore, DOE predicts no volatilization of wastes, either before or after closure of the repository.

Although there would be heat in the emplacement drifts during preclosure operations, ventilation systems would keep the temperatures below the boiling point.

Because of the evolving nature of the design of the repository, DOE issued a Supplement to the Draft EIS in May 2001 for public review. This Supplement and the Final EIS describe the impacts of the repository based on the most recent repository design. The repository design has evolved to include the flexibility to operate in either a higher- or a lower-temperature mode after closure. Higher-temperature means that at least a portion of the rock wall in the emplacement drift would have a maximum temperature above the boiling point of water. Operations in the lower-temperature mode would ensure that the rock wall would remain at a temperature below the boiling point of water and would keep the average maximum surface temperature of the waste packages below 85°C (185°F) to avoid conditions that could increase the rate of waste package corrosion. DOE believes that ongoing site characterization and design-related evaluations will continue to improve projected repository performance and reduce associated uncertainties.

7.2 (12187)

Comment - 010073 / 0015

Page 2-9 - The SDEIS does not consider the potential for an extended fuel-aging process to also extend the transportation campaign.

Response

The commenter is correct. Under any of the flexible design operating modes, DOE would receive commercial and DOE spent nuclear fuel and high level radioactive waste over a 24-year period. Differences in the flexible design modes would not directly affect transportation to the repository. DOE intends to maintain the transportation schedule described in the Draft EIS.

7.2 (12780)

Comment - 010212 / 0004

Footnote d to Table S-1 refers to an assumption for the lower-temperature operating mode over a 50-year period ending in 2060. We understand the purpose for the additional aging before emplacement is to reduce thermal loading in the drifts. Does that affect the waste acceptance rates for commercial spent fuel or does it mean that the fuel will be stored at the fuel aging area that is part of this operating mode alternative?

Spent nuclear fuel from commercial nuclear plants was supposed to have begin acceptance by DOE in January 1998, according to the mandate of Nuclear Waste Policy Act and under terms of the contracts DOE required plant operators to enter into in 1983. The earliest that DOE indicates spent fuel would be accepted is 2010, on the

presumption of the proposed action that Yucca Mountain is found suitable for the repository and that a license authorizing construction is issued sometime in 2005.

The nuclear utilities have been placed in a bind by the delay in waste acceptance. Many have already had to make investments to expand reactor site storage that should not have been necessary if DOE had met the 1998 milestone or had taken other steps to move spent fuel per the waste acceptance schedule to other DOE-managed sites on a temporary basis. As a consequence, many utilities expanded their on-site storage capacity and others will need to before waste acceptance begins in 2010 or later. Many utilities have entered into litigation seeking waste removal and cost recovery for damages from DOE's breach of contract.

We raise this question in the context of the need to move the spent fuel from reactor sites in a timely fashion as move spent fuel accumulates. This must be a priority regardless of whether the lower or higher temperature-operating mode is the one selected. Therefore, the aging facility needs to be sized accordingly if the lower-temperature mode is adopted.

Response

As discussed in Section 2.2.2.2.2 of the Supplement to the Draft EIS, commercial spent nuclear fuel would be the major contributor of heat in the repository. It would have a wide range of thermal outputs. The thermal output of the waste packages could, however, be reduced by varying waste package loading. Commercial spent nuclear fuel waste package loading could be varied by (1) placing low-heat-output (older) fuel with high-heat-output (younger) fuel in the same waste package (fuel blending), (2) limiting the number of spent nuclear fuel assemblies to less than the waste package design capacity (derating), (3) using smaller waste packages, or (4) placing younger fuel in a surface aging area to allow its heat output to dissipate so it could meet thermal goals for later emplacement. Section 2.3.2.1 of the Supplement to the Draft EIS describes the fuel blending process further. Reducing the thermal output of the waste package through any of these means would achieve lower waste package and drift wall temperatures. DOE would consider aging as much as 40,000 metric tons of heavy metal of commercial spent nuclear fuel during a 50-year period.

The flexible design for the repository allows flexibility in the types of commercial spent nuclear fuel that DOE would be receive. However, the estimated receipts are based on DOE projections of actions that would be taken by utilities to deliver spent nuclear fuel for disposal and are independent of the repository design. Instead, they are based on the terms of DOE's Standard Contract for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste contained in 10 CFR Part 961 and the generation and storage characteristics of each generator site (see discussion of CALVIN computer code in Section J.1.1.1 of the EIS). Therefore, DOE believes that the flexible design, including the blending facility, would accommodate fuel that would be shipped to a Yucca Mountain repository based on the terms of the Standard Contract.

7.3 Repository Long-Term Performance

7.3 (7)

Comment - 24 comments summarized

Commenters said that Total System Performance Assessment evaluations are close to the status required for licensing reviews. However, improvements needed for licensing would include revision or refinement of model details, revision of parameter values as a result of data additions, and improvement of quality assurance basis for models, computer codes, and data. One commenter said that the long-term consequences in the Draft EIS suffer from the shortcomings that they are a snapshot in an evolutionary process. Commenters felt that the Viability Assessment provided only a limited description of the methodology, assumptions, and use of information in the Total System Performance Assessment (DIRS 101779-DOE 1998).

Response

DOE has continued technical development of the Total System Performance Assessment since publication of the Draft EIS, including further site characterization, improvements to the engineered system design, system performance assessment calculations, and quality assurance and validation of results. Chapter 5 and Appendix I of the Final EIS reports on the modified assumptions and methodologies utilized. DOE agrees that the process requires continual refinement and improvement.